Nonpoint Source Management Annual Report

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NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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Nonpoint Source Management Annual Report 2004

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Cover photo: Moose on the Swift River; taken by Steve Landry, DES.

Table of Contents

Introduction

How can we measure success in dealing with nonpoint source pollution? We have learned how impervious surfaces influence stream hydrology and water quality, that stormwater almost always carries abundant bacteria, that soil is a pollutant, carrying extra nutrients to over-fortify the water and forever change aquatic habitat, and that every action we take on the land causes change in the water. To fully address nonpoint source pollution is to completely change the way we treat the land. The *2004 Nonpoint Source Management Annual Report* describes many projects and programs that demonstrate how we can reduce our impact on water. In many of them, we have attempted to measure the decline in pollution – see Appendix D. It is an imprecise science, but one that is necessary to gage how we're doing in making progress toward cleaner water. The Report summarizes the projects completed during the federal fiscal year 2004, lists the new grants awarded, and highlights a few projects to illustrate what it takes to improve water quality.

Education and Outreach

The Section 319 grant program was highlighted and supported through continuing outreach and education efforts in addition to several new initiatives.

GreenWorks, a monthly newspaper column addressing water quality and the environment is now published as an e-newsletter and sent to all staff at DES, and to weekly and daily newspapers and newsletters throughout New Hampshire. In 2004, topics included: "Clean Cars and Clean Water Can Be a Goal of Fundraisers," "Keeping Our Waterways Drug-Free: What to Do with Unused Drugs and Personal Care Products," "Volunteers Needed to Help Clean New Hampshire Waterways," and "Spending Less to Stay Warm This Winter." Past publications can be found at www.des.nh.gov/gw-list.htm.

The Town of Hudson received a Small Education and Outreach Grant to protect the water quality of Robinson Pond.

In April, a workshop focusing on the tools and techniques needed to develop and conduct an effective outreach program for stormwater nonpoint source pollution and general watershed protection was held for state and local officials, and others charged with developing or implementing public education efforts (especially Stormwater Phase II). The workshop addressed such topics as developing an effective strategy, producing and distributing outreach materials and working with the media. Presenters included representatives from EPA, Tetra Tech, DES, UNH, NHDOT and local department of public works staff. Follow-up evaluations from the over 70 participants indicated that the workshop was very successful in meeting attendees' needs.

Working with the NHDOT and EPA, DES started planning the outreach and education strategy to address water quality issues regarding salt management by municipalities along the I-93 expansion project corridor. A "No Salt Lunch" focus group was conducted with Phase II community public works department contacts to assist with identifying and addressing what is necessary to facilitate a change in salt application and

Small Education and Outreach Grants		
Project Description	**Organization**	**Amount Paid**
Incorporation of Watershed Education for Teachers (WET) into the Pollard School, Plaistow curriculum.	Town of Plaistow	$2,000
Workshop and training entitled *Healthy Water, Healthy People New Hampshire*	DES Source Water Protection Program	$1,391
Stewardship brochure for riverfront landowners in the Exeter River Watershed	Exeter River Local Advisory Committee	$1,740
Protecting water quality of the Pemigewasset River, managing growth and maintaining vegetated buffers	Lakes Region Planning Commission	$1,997
Development of a website for the Lake Winnipesaukee watershed	Lake Winnipesaukee Association	$1,350
Volunteer training, newsletter and kiosk, Crystal Lake, Manchester	Crystal Lake Preservation Association	$1,889
Storm drain stenciling and creation of stenciling template in Grafton County, Connecticut River watershed	Grafton County	$1,970
Shellfish Stewards education and outreach projects	Aquaculture Education & Research Center	$1,400
Education and awareness of the water quality of Robinson Pond, Hudson	Town of Hudson	$1,445

maintenance procedures. This was the first step in a comprehensive process of providing hands-on technical assistance, education, and support services to municipal winter maintenance staff and decision makers.

The Department's Small Outreach and Education Grant Program for Watershed Organizations continued to provide project implementation financial assistance with an additional focus on providing technical assistance toward the outreach and education planning process. The following is a summary of the projects that were completed in 2004.

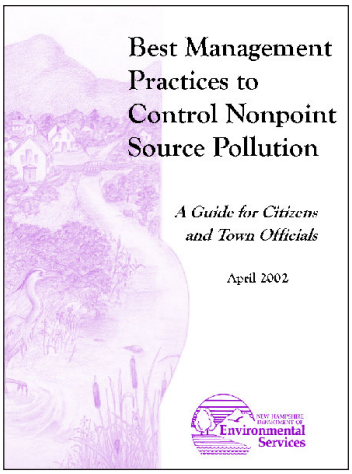
BMP Guide to Control Nonpoint Source Pollution Revised

Best Management Practices to Control Nonpoint Source Pollution: A Guide for Citizens and Town Officials, otherwise known as the "purple book" was updated in 2004. This guide describes the causes of NPS pollution and suggests ways that it can be prevented or reduced. From backyards to salvage yards, on farms or construction sites, the guide serves as a comprehensive reference for everyone from homeowners and volunteers, to businesses and town officials. Last updated in 1997, the guide was completely re-written to incorporate the latest information on BMPs, regulations and resource tools. New chapters were added, including "Best Management Practices for Developed or Developing Land," "Funding Opportunities," and "Education and Outreach."

Mailed to all New Hampshire town and city conservation commissions, planning boards, and over 1,000 additional contacts this has proved to be a very popular document. In addition to being available on-line and distributed at workshops and conferences, over 100 additional requests for the guide have been fulfilled.

The Town of Wakefield has realized the value of this document by encouraging the

local planning board to evaluate some new approaches to minimize the impact of a 71 acre development just above a lake. Some of the approaches discussed by the planning board and the developer included: restricting development and uses on over half of the property (through a conservation easement and covenant agreements); shared driveways; maintaining a 30-foot no clearing buffer between cleared areas and the lake; maintaining natural land cover near smaller streams that run through the property and providing small bioretention areas or rain gardens for each house lot to capture and treat any runoff generated by the new development.



Smart Growth

Under the Regional Environmental Planning Program, DES worked with the nine regional planning commissions to generate two new statewide data sets identifying existing community center areas and key types of destinations within each community. Tese data will be used to develop indicator measures to assess changes and differences in land development patterns and assess the impact of sprawl. These new data will also be useful for local and regional planning efforts, such as local master plans and planning for alternative modes of transportation. DES will be working to finalize these data sets in 2005. Work will also continue to develop and evaluate a concise set of sprawl indicator measures.

Traditional subdivision

Open space development.

In 2004 DES continued working with the Department of Transportation, the Office of Energy and Planning, and four regional planning commissions on a proposal to provide planning assistance to 23 towns in the I-93 service area in conjunction with the I-93 improvement project. The technical assistance program will support innovative planning, promote implementation of smart growth development practices and support regional and local conservation efforts to maintain open space and protect unfragmented habitats.

DES continues to be involved with the Natural Resource Outreach Coalition (NROC), which provides a public education presentation and facilitated meeting program to help coastal communities better manage growth, minimize the impact of development on water quality and move forward with their efforts to protect open space. DES staff served as a co-presenter and lead follow-up facilitator for two communities last year. DES staff also led several NROC workshops on conducting effective public education and outreach. Other assistance included providing information on implementing better conservation subdivision design regulations, guidance on developing an open space plan that incorporates wildlife and water quality concerns and information on how local municipalities can require better stormwater management through local regulations.

DES gave several presentations on minimizing the impact of development on water resources through site design, conservation subdivision design, low-impact development stormwater management, and smart growth techniques for rearranging development within a watershed. This presentation was given for two local communities and for a regional workshop addressing impervious cover. As a result of the presentations, both communities are working to strengthen their local development requirements. DES has also provided follow-up technical assistance to these communities in support of their efforts.

Evaluating Stormwater Treatment Technologies

The varied and diffuse sources of stormwater pollutants create difficulties for designing and implementing prevention and remediation techniques. Traditional stormwater treatment methods such as grass-lined swales and detention basins have been shown to have mixed results reducing bacteria concentrations, especially during winter weather, and may actually increase the bacteria load under certain conditions. These factors have led to the need to research and evaluate new and innovative technologies and to educate municipalities and developers on the variety of treatment systems available and the situations in which they work best. One of these innovative treatment technologies was demonstrated in the Town of Seabrook through a 319 grant that installed and evaluated the Smart Sponge Plus system in removing bacteria concentrations in stormwater runoff to the Hampton/Seabrook harbor.

Proper handling and treatment of stormwater is necessary in every community

Center for Stormwater Technology Evaluation and Verification (CSTEV)

In response to the lack of comparative scientific analysis on the effectiveness of various BMPs designed to treat stormwater, a cooperative effort between the National Oceanic and Atmospheric Administration (NOAA) and the University of New Hampshire (UNH), the Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET), has led to the creation of the Center for Stormwater Technology Evaluation and Verification (CSTEV) located at UNH in Durham. CSTEV is currently testing 11 different devices, including conventional treatments (e.g. swales and ponds), low impact development designs (e.g. permeable pavement and biore-tention systems) and manu-

CSTEV workshops support municipal managers, engineers, and others charged with developing and implementing stormwater management plans.

factured devices (e.g. swirl separators). The results of their research will prove valuable to municipal managers and other struggling with stormwater treatment decisions. For further information go to www.unh.edu/erg/cstev/.

New Stormwater Guidance on the Horizon

A new guidance document is being developed for stormwater best management practices (BMPs). The guidance will be designed to assist developers in meeting the requirements for obtaining a Section 401 Water Quality Certification. Under Section 401 of the Clean Water Act, any person applying for a federal license or permit (e.g., Wetlands or National Pollutant Discharge Elimination System (NPDES) permits) to conduct an activity that may result in a discharge into navigable waters, shall provide the licensing or permitting agency with a certification from the state that the discharge will meet state surface water quality standards. For waters that are listed as impaired under Section 303(d) of the Clean Water Act, the activity cannot contribute any additional loading of any pollutant(s) for which the receiving water is impaired.

Specifically, the guidance is intended to assist developers with creating required Storm Water Pollution Prevention Plans (SWPPPs) to describe how they will apply appropriate BMPs to meet the goal of no additional loading in order to obtain their 401 Certification and federal permit. It will include such information as common construction site pollutants, recommended BMPs to address those pollutants, and estimates of BMP pollutant removal efficiencies.

It is anticipated that future use of the guidance will include its adoption into the DES Alteration of Terrain rules as well as its use by municipalities and regional planning agencies. For more information contact Jillian Jones at (603) 271-8475.

Highlights and Overview of Completed Projects

Coastal Watershed

EPA Phase II NPDES Stormwater Public Education Video (2001)[1]

The City of Rochester and the Seacoast Stormwater Coalition used 319 funds to develop a 30-minute public informational video program to address stormwater runoff for communities that must meet the new Federal Storm Water Phase II requirements. The Coalition was comprised of representatives from Rochester, Dover, Durham, Exeter, Portsmouth, NH Department of Transportation and the University of New Hampshire.

The video, titled *Stormwater Runoff, There is No Away*, is designed to be used in schools and community action programs to educate the public on the impacts of

[1] The dates appearing in project titles reflect the federal fiscal year in which the 319 grant was awarded.

stormwater on water quality. The video uses New Hampshire seacoast scenes and local municipal employees to bring home the importance of protecting local watersheds through stormwater controls. The video raises public awareness about pollution sources and impacts to drinking, recreational and fishing waters and provides ideas on how individuals can lessen or prevent water pollution.

Copies of the video were sent to all of the New Hampshire towns required to meet the new stormwater regulations and are also available on loan through DES to interested schools, libraries, civic groups, and service clubs.

Shoreline Habitat Assessment and Land Protection along the Exeter River (2002)

Utilizing habitat assessments conducted by UNH, this project provided the resources to carry out an education and outreach campaign for local conservation commissions and landowners on the need for land protection along the Exeter River corridor. This was done through the distribution of educational materials to the public, meetings with local planning boards and conservation commissions, and the drafting of warrant articles and land use ordinances.

Treatment of Stormwater Runoff from Route 1A North Beach, Seabrook (1999) and BMP Verification Project for Stormwater Treatment Device (1999)

These two projects involved the installation and then evaluation of a stormwater treatment device in the Hampton/Seabrook Harbor area. The closure of shellfish beds in this area continues to be a problem following rainfall events. Effectively treating stormwater is a challenging task. The variability of pollutants, the unpredictability of storm events and costs all play a factor in determining the most feasible options for removing storm-water pollutants. Reducing bacteria contamination will require innovative solutions.

Final discharge point of stormwater treated with the Smart Sponge Plus, Seabrook.

The first project involved an agreement with the Town of Seabrook who contracted with Millennium Engineering to design an in-line treatment system to treat stormwater from the North Beach area, Route 1A, Seabrook. The technology selected was a product called the Smart Sponge Plus, a blend of synthetic polymers designed to remove hydrocarbons and treat microorganisms. Manufactured by AbTech Industries, Inc., the Smart Sponge Plus was installed in an existing stormwater pump station.

The effectiveness of the Smart Sponge Plus in reducing bacteria concentrations in the stormwater discharge to the adjacent salt marsh were evaluated by the University of New Hampshire with a second grant. The BMP verification project was designed to evaluate the effectiveness of one type of solution, in treating bacteria pollutants in stormwater.

The sample collection procedures and laboratory methodologies are documented in the *Seabrook Stormwater Verification Project Quality Assurance Project Plan*. Samples were collected from the influent (pre-treatment) and effluent (post-treatment) for analysis of bacterial concentrations and loadings during 15 storm events from September 3, 2003 to May 24, 2004, excluding winter months. The 15 storms included events with a range of rainfall intensities and amounts, as well as accompanying runoff volumes. Flow-weighted composite samples were analyzed for fecal coliforms, *Escherichia coli* and enterococci to determine if concentrations were lowered as stormwater passed through the Smart Sponge Plus material.

Automated sampler used to collect samples in the evaluation of the Smart Sponge Plus.

In most cases, bacterial concentrations were reduced within the treatment system, but to varying degrees. The efficiency ratio based on reduction in event mean concentration for each bacterial indicator in the flow was calculated for each storm event. The overall load reductions for the bacterial indicators were 50.3 percent for fecal coliforms, 51.3 percent for *Escherichia coli* and 43.2 percent for enterococci. Overall, the observed reductions in bacterial concentrations in post-treatment stormwater would still result in discharge of elevated bacterial levels that would continue to limit uses in receiving waters. The greatest bacterial concentration reduction achieved with the Smart Sponge Plus was 85 percent for fecal coliform and *E. coli* during a storm event that totaled 0.31 inches. Based on the highly variable removal efficiencies and intense maintenance requirement for the removal of trash, the installation of a Smart Sponge Plus in a water quality inlet of an intensely developed watershed is not practical.

Stratham Circle Mill Pond Restoration (2000)

The objective of this project was to improve the water quality of the historic Mill Pond in Stratham and to decrease the potential for pollutants to contaminate the downstream Squamscott River. The project involved the dredging of the Mill Pond and a survey to determine the causes of siltation and pollution to the pond so that the town can institute prevention measures against future contamination. (See detailed write-up in the 2003 annual report.)

Applehurst Dairy Farm (2001)

Applehurst Dairy Farm manages approximately 35 Holstein milk cows and an equal number of replacement heifers. Livestock are milked twice per day and stalls are bedded with wood shavings and sand. The resulting manure mixture is solid and stackable. Although there is enough cropland upon which to recycle the annually produced waste, the manure storage and milkhouse waste treatment systems were substandard. Clean

Water Act Section 319 funds were used to construct a new manure storage facility and a vegetated channel to treat the milk-house waste. These improvements helped eliminate the discharge of nutrient wastes that were contaminating the Lamprey River and surrounding water bodies.

Dairy cows at the Applehurst Dairy Farm, Epping.

Gulf Watch Blue Mussel Monitoring (2002)

The Memorandum of Agreement describes a project which has been agreed to between the Association of US Delegates to the Gulf of Maine Council and the New Hampshire Department of Environmental Services to determine the public health threat of metals and organic compounds in the tissue of blue mussels. This project was also funded under the provisions of the National Estuaries Program.

Peirce Island Shoreline Stabilization, Phase II (2002)

Stabilization work underway on Peirce Island, Portsmouth.

This implementation project represents a follow-up to the phase one shoreline stabilization engineering/design work completed in federal fiscal year 2003, and aims to reduce nonpoint source pollution from Peirce Island to the Piscataqua River. The reduction of soil loss to the Piscataqua River was accomplished by stabilizing the shoreline through the installation of graded riprap with planter pockets built into the rock mass.

Strafford Country Canoe Launch (2001)

With the help of 4-H volunteers, this project helped reduce soil erosion and improve water quality at an existing canoe launch on the Cocheco River. The work consisted of stabilizing the erosion by grading the bank and installing pervious concrete blocks which were then backfilled with on-site soil and seeded with native vegetation. A sign to acknowledge the work and to promote the use of the site was also erected.

Merrimack River Watershed

NPS Pollution Reduction for Center Harbor Bay, Lake Winnipesaukee (1999)

This project addressed the erosion problems occurring at Center Harbor's beach and parking area, causing sediment and other pollutants to enter Lake Winnipesaukee. Runoff generated on Route 25, discharged from a culvert at the top of a slope and eroded channels through dirt parking areas, across basketball courts, over gravel lanes and down the steps leading to the beach where it was estimated that approximately 32 tons of sand and gravel per year were eroded and deposited in the lake. County, town and state officials realized that stormwater retrofits and other BMPs needed to be incorporated into the park area to properly manage stormwater and to eliminate erosion and sedimentation.

The Belknap County Conservation District (BCCD) worked with the Natural Resource Conservation Service (NRCS) and the Town of Center Harbor to delineate catch-


Center Harbor Beach with erosion (left) and after restoration (right).

ment areas contributing runoff to the park area and to design BMPs that would channel, infiltrate and safely discharge stormwater to the lake. In 2001, construction began on the stormwater collection and conveyance system for runoff generated along Route 25. The system involved the installation of drop inlets and a closed drainage system that discharges into a surge protection pool/extended wet detention basin. Stormwater is allowed to infiltrate rather than flow directly down the stairs, over the beach and into the lake. Grass swales were also built into the landscape to deliver runoff to the detention basin during moderate to heavy rain events. Significant infiltration occurs along the length of these swales and only the more significant rain events produce discharge into the basin.

A unique feature of the project was the installation of "Grassy Pavers" to replace an eroded slope in the parking area. Prior to 2000, the beach parking area was a dirt lot that was extremely susceptible to sheet flow, erosion and sediment transport to the lake. Due to the heavy vehicle loads in the summer months, the sand became compacted and impervious. The Center Harbor Fire Department put in many extra hours during the summers of 2001 and 2002 to ensure that seeded areas received ample irrigation in order to establish and maintain the new parking surface. The Grassy Paver parking area has provided a durable platform for vehicles that not only infiltrates stormwater but also creates more green space at the park. The success of the Grassy Paver at the Beach area has prompted Center Harbor officials to consider similar installations by the pavilion and basketball court for vehicle parking.

Drop inlet and culvert that collects and conveys runoff from Route 25 safely to detention pond.

The combination of drop inlets, closed drainage conveyances, detention basin, grass swales, stabilized outlet structures and the Grassy Paver parking lot has had a profound effect upon the beach, park and Lake Winnipesaukee. When all structures are considered together, the Center Harbor restoration project has resulted in annual reductions of 1,605 pounds, 17 pounds, and 5 pounds of total suspended solids, nitrogen and total phosphorus respectively. Center Harbor Parks and Recreation staff may have to update their "Keep off the Grass" signs

in favor of "Keep on the Grass" notices at the beach and park areas during the upcoming summer season to ensure that BMPs are properly maintained and utilized.

Watershed Sensitive Parking Area along the Piscataquog River (2000)

This project involved the development of a watershed sensitive parking area and construction of an educational kiosk at the Piscataquog River Park in West Manchester. The new parking area and educational display will help to reduce environmental degradation along the river and will improve the recreational use of the park.

Mine Falls Park Bank Erosion (2000)

Another project that improved recreational value in conjunction with implementation of best management practices in the Merrimack River Watershed was at Mine Falls Park, Nashua. This project involved repairing damage done to an existing hiking and bicycling trail along the Nashua River. The work involved installing erosion control media and plantings and relocating the trail in certain locations. These upgrades will prevent future erosion, and enhance the quality of this recreational trail.

Water bar installed across Mine Falls Park trail.

Two Merrimack Country Dairy Farms Receive Assistance: Marston's Dairy Farm, Pittsfield (2000) and Great Ash Farm, Webster (2000)

Livestock and water quality both benefited through the cooperation of various federal, state and local organizations and the assistance of 319 funds. When dairy farms in New Hampshire were being situated on the landscape in the nineteenth century, one of the primary attributes sought after was clean, running water that livestock could access. Marston's Dairy Farm in Pittsfield was no exception. The farm straddles a perennial drainage that courses through the farm property for just over 500 feet before it enters the Suncook River. The confluence of this tributary on the Suncook River is upstream of water supply intakes for the towns of Epsom, Chichester, Allenstown and Pembroke. It is estimated that 40,000 gallons of water per day pass through the barnyard. Prior to the construction of the BMPs, this drainage collected nutrients and bacteria from manure along with sediment from heavy use areas.

New gated feed lot at Marstons Dairy Farm, Pittsfield.

The purpose of this project was to address both stormwater and nonpoint source pollutants and to incorporate best management practices that would benefit the environment as well as improve the overall management of the farm. Discussions between the Natural Resources Conservation Service (NRCS) and the Marston Family determined that construction of BMPs would focus upon the creation of a new feedlot with proper drainage and a roof, fencing to eliminate direct, livestock ac-

cess to surface water, and paving of heavy traffic areas with closed drainage systems. It was also decided that the existing dirt lanes that supported heavy vehicular traffic loads, would need to be regraded and resurfaced with concrete or asphalt in order to properly channel runoff to designated treatment areas.

Construction of a gated feedlot with a roof began in 2001. The textured concrete that was poured for the floor of the covered feedlot was extended beyond the end of the barn to create an exterior heavy-use area where livestock congregate to feed. The concrete floor of the covered feedlot and the exterior heavy-use area allow for scraping, transport and storage of manure. Surface runoff is redirected through the installation of an improved drainage system and culvert. Upgrades to the closed drainage system include drop inlets, and new pipes that redirect the flow. Improvements to the existing manure storage facility were also made and included replacement of the wood containment structure with concrete block. Fencing has been installed to direct animal activity away from surface waters and treatment areas.

Newly constructed manure storage facility at Marstons Dairy Farm, Pittsfield.

Prior to the installation of these BMPs, manure was deposited on the bare ground, allowing for much of the nutrients to leach into the ground and surface waters. Now these animals are fed on a covered feed ally where all manure is recovered and stored until it can be land applied in the spring. This system prevents pathogens and several hundred pounds of nitrogen and phosphorus from reaching the Suncook River on an annual basis. Further, the paving of traffic areas and fencing has redirected drainage and allowed for the growth of vegetated buffers reducing the potential for sediment and nutrient contamination to the river.

The Great Ash Farm in Webster was also able to significantly improve its operations through the receipt of a 319 grant. The Great Ash Farm has been a commercially operated dairy farm since 1944. This fourth generation farm expanded from milking and housing 15 cows to a current herd size of 200. The increased pressure of the larger herd on limited acres of open pasture and the lack of housing and covered hard surface feeding/loafing areas were leading to significant sediment and nutrient loading to adjacent surface waters. It is estimated that approximately 20 tons of soil and manure were moving by sheet and gully erosion each year. The sediment, nutrients and bacteria carried in this runoff were transported into a small tributary that feeds the Blackwater River.

Feedlot at Great Ash Farm before construction.

Again, the NRCS provided assistance to the owners of the farm and determined that a new feedlot area with proper drainage would need to be constructed; fencing would need to be installed,

Covered feedlot with closed drainage system at Great Ash Farm.

along with livestock lanes and swale crossings. Separation of clean runoff from livestock areas and infiltration of stormwater would also be a focus of this project.

Construction at the Great Ash Farm began in December of 2000. The existing, concrete heavy-use area was covered by a single pitch, truss roof, which created a 50 by 100 foot covered feedlot and bedding area for livestock. The construction of the roof also allowed for the installation of half-round gutters along the roof line that drain into down-spouts connected to a closed drainage system that outlets into a vegetated swale. The covered feedlot and open stall heavy-use area also allows for efficient recovery of manure on a daily basis. Only 40 percent of manure generated by the herd was recovered historically, as compared to the 75 percent recovery rate that can be achieved with the newly installed BMPs. In addition to the roof over the heavy-use area, fencing and a controlled swale crossing for livestock were also installed. Fencing was established around the perimeter of the grassed swale to provide a 25-foot buffer area for filtration of runoff from grazing areas. A culvert and bridge provide access for livestock to additional pasture areas. It is anticipated that the existing five acres of pasture area will be broken up into three separate paddock areas for rotational grazing with lanes and travel routes to promote sustainable growth of vegetation in these areas.

NRCS calculations estimate that the new BMPs prevent approximately 162,925 gallons of clean rain water from mixing with livestock waste on an annual basis. The separation of clean runoff from heavy-use areas has resulted in the recovery of 4,082 pounds of nitrogen and 635 pounds of phosphorus on an annual basis. These nutrients no longer reach surface waters and can be incorporated into the Great Ash Farm nutrient budget. NRCS and Merrimack County Conservation District (MCCD) staff will continue to work on improvements at the Great Ash Farm that will meet both the demands of the dairy economy and the integrity of surface waters in New Hampshire.

Both the Marston's Dairy Farm and Great Ash Farm projects have been promoted by the MCCD. An educational brochure was produced that showcases the low cost and easily maintained BMPs installed at Marston's Farm. At the Great Ash Farm, a free workshop was organized by the MCCD to highlight the cost-share project completed at the farm. Participants at the

Cows using newly constructed path over stream at the Great Ash Farm, Webster.

workshop learned how they can implement similar projects on their farms, where to access technical assistance and grant funds, and how to apply for cost-share assistance programs. In addition to viewing the recently completed BMPs at the Great Ash Farm, participants also heard about the improved herd health and milk production associated with the recent improvements to the farm. The workshop was sponsored by EPA, DES, the USDA Farm Service Agency, NRCS, MCCD, Webster Conservation Commission and the Drown family: Robert, Kay and Robert Jr. of Great Ash Farm. The promotion of these projects will hopefully encourage similar applications at other local farms.

Mill Street Stormwater Upgrades, Wolfeboro (2000)

Excessive sediment loading to Back Bay in Wolfeboro was determined to be caused from the stormwater drainage system servicing Route 109 and Mill Street. This project involved the installation of a stormwater drainage and treatment system, which will stop stormwater runoff from carrying sediment into Back Bay and Lake Winnipesaukee.

Installation of new stormwater device, Mill Street, Wolfeboro.

Darah Pond Erosion and Sediment Control, Litchfield (2001)

Erosion to the Litchfield Town Beach on Darah Pond was corrected through this project. Drop inlets, outlets and treatment swales were constructed in addition to improvements being made to the walkway and the beach area itself. The USDA Natural Resources Conservation Service (NRCS) designed the improvements and estimated that the project has resulted in an annual reduction of approximately 6.4 tons of sediment to the pond.

Litchfield Town Beach on Darah Pond showing erosion before restoration (left). Drainage swale and drop inlet after restoration (right).

Baker River Watershed Erosion Control Project (1999)

The purpose of this project was to assess the severity of the erosion/deposition problem on the Baker River and to design and construct a demonstration project. The first step was to reestablish the Baker River Association, and involve local communities in


Erosion along the bank of the Baker River (left). Bendway weir diverting the flow of the Baker River (right).

Grafton County Conservation District's efforts. A demonstration site was selected and the USDA NRCS was contacted to provide assistance with the project design. The design involved using four bendway weirs to redirect the flow away from an unstable high bank. After installation of the weirs, landscaping fabric was placed at the top of the bank and a conservation mix with additional buffer plants were planted. An assessment of the project in 2003 revealed that the design is performing as intended with the higher velocity current being to the mid-channel of the streambed. The results of the project will be helpful in the design of solutions to other problem sites along the river.

Baker River Watershed Management Plan (2001)

The Baker River Watershed Association (BRWA) utilized grant funds to contract with Wildlife to Watershed, Inc. to draft a watershed plan. With input from DES and residents in the towns of Warren, Wentworth, Rumney and Plymouth, a final Watershed Plan was written. Another part of the project involved encouraging the expansion of vegetated buffers and assisting interested riparian landowners with the development of solutions to erosion problems. Two landowners were selected for erosion controls and were assisted through the permitting process. However, further outreach will be necessary to develop and expand vegetated buffers.

Quantification of Tributary Phosphorous Loading to French Pond, Henniker (2001)

Results of previous DES studies such as the 1985 Diagnostic and Feasibility Study identified French Pond as eutrophic, with 50 percent of the phosphorus input coming from tributaries at base-flow. As a result of DES Volunteer Lake Assessment Program studies, it was also determined that a significant amount of phosphorus was reintroduced into the water column from bottom sediments. The goal of this project was to determine the phosphorus budget for French Pond using episodic flows in addition to the base-flow values. In addition to compiling a septic system survey, volunteers from the Henniker Conservation Commission, French Pond Association, and New England College conducted dry and wet-weather (episodic) sampling in compliance with an EPA approved Quality Assurance Project Plan.

Gillingham Drive Stormwater Management, Newbury (2001)

Grant funds were used to fund an engineering design for a stormwater treatment system to be installed during the scheduled reconstruction of Gillingham Drive. Gillingham Drive runs along the shore of Lake Todd and contributes non-point pollution to it. Phase II of the project will involve the installation of the new system.

Saco River Watershed

Swift River Channel Stability Analysis at Conway Scenic Railroad Bridge (2001)

When the rail line from Conway to North Conway was completed in 1872, project engineers had never heard of terms like regional flow curves, aggredation, bankfull stage, meander wavelength, or fluvial geomorphology. Fill material was brought in to level the grade of the rail line as it approached the Swift River and crossed over on a wooden trestle supported by wood pilings. In 1921, the` wooden trestle bridge was replaced with concrete abutments and a steel trestle that continues to serve the Conway Scenic Railroad to this day. Unfortunately, the construction of the rail line on the active floodplain of the Swift River caused a series of adjustments in channel pattern that have undermined the structural integrity of the railroad and severely degraded the aquatic habitat of the river upstream of the bridge.

The reach of the Swift River in the vicinity of the railroad bridge has been the site of ongoing erosion and general channel instability for the past 133 years. The south river bank and railroad embankment have seen the greatest erosion in recent years. The Conway Scenic Railroad received a permit from the Wetlands Bureau in 2001 to place 180 linear feet of rock rip-rap along the upstream face of the railroad embankment on the south side of the river. A condition of the permit states that "*Additional request to dredge and/or fill in this area of the Swift River shall not be considered or approved until a complete analysis and assessment has been conducted by the applicant to determine a more effective, long-term solution, which alleviates the deposition and erosion problem and has a lesser degree of environmental impact*."

Conway Scenic Railroad Bridge over the Swift River.

In 2002, the Swift River Local Advisory Committee (SRLAC) was awarded a 319 Restoration Grant to fund a geomorphological study of this reach of the Swift River and develop preliminary plans and cost estimates to implement a long-term solution. Matching funds for this project were provided by New Hampshire Fish and Game. The geomorphological assessment found that the primary problem is the river's inability to transport its sediment load, especially bedload (gravel and cobble moved along the river bed), through the bridge opening. As a result, this material had deposited within the channel upstream of the bridge, leading to a shift in river alignment and erosion of adjacent lands, including the railroad embankment. The cause of this problem was determined to be the flood plain obstruction created by the railroad embankment fill. Floodwaters that would normally flow down valley over the flood plain are blocked by the embankments and forced through the bridge opening, creating backwater upstream of the bridge. Further, the river channel upstream of the bridge has now become too shallow and too wide to provide adequate habitat for aquatic species.

To correct this situation, the restoration plan calls for the installation of a large span, concrete, arch culvert through the embankment fill on the south side of the bridge. This

would reconnect the flood plain upstream and downstream of the railroad embankment and reduce the backwater effect, which initiated the excess deposition and channel instability. Installation of two, precast concrete box culverts are recommended through the embankment fill on the north side of the bridge. These culverts would only convey water during extreme flood events and would reduce flow contraction and backwatering. Reconstruction and reconfiguration of the river channel upstream of the bridge is also proposed. The reconstructed section of river would be narrower and deeper with a straighter approach to the bridge opening. Numerous mature riparian shrubs would be transplanted to the reconstructed banks to provide rapid riverbank revegetation for long-term bank stabilization. A rock "cross-vane" structure is proposed upstream of the bridge to control the grade of the river bed, reduce stress on the reconstructed river banks, and focus high-velocity flows in the center of the channel.

The estimated cost to implement these improvements on the Swift River is $843,000, which includes final design, permitting, and construction. The assessment report also indicated that under ideal conditions, the existing bridge would be removed and replaced with a new, longer bridge that would span both the channel and the floodplain. That option, however, would likely cost millions of dollars, making the project unfeasible. The Swift River Local Advisory Committee, Conway Scenic Railroad, Kennett Corporation, US Forest Service, NH Fish and Game, and DES will continue to evaluate the recommendations put forth by this study and move forward toward implementation of river restoration along this reach of the Swift River in New Hampshire.

Ossipee Watershed Water Quality Monitoring Project (2002)

This project developed a pilot for comprehensive water quality monitoring program in that Ossipee Watershed that will establish baseline water chemistry data, record descriptions of riparian and vegetative habitat and list land use activity within a 200-foot buffer of test sites.

Chocorua Lake Restoration, Phase II – Monitoring (2000)

The purpose of this project was to evaluate the long-term effects of BMPs that were installed in 2002 along Route 16 to reduce phosphorus loadings to Chocorua Lake. Overall, the BMPs that were installed, continue perform effectively, with total phosphorus loading maintaining an average 92 percent reduction from pre-BMP installation in 1997; and, a 60 percent reduction, compared to the initial post BMP installation measurements taken in 2000.

Connecticut River Watershed

Riparian Buffer Research, Demonstration and Education Project (2001)

Funds were provided to help the UNH Cooperative Extension research the benefits of riparian buffers. The project included the creation of buffer demonstration sites in the Connecticut River watershed for researchers to manipulate design parameters, monitor physical conditions, and collect water quality data. This was done to determine which type of buffer performs best in a given situation.

Additional components of the project included a study of the composition and effectiveness of existing buffers in the area, and the development of training, education, and outreach programs relating to the economic and environmental benefits of riparian buffer zones.

This is an on-going project, with farmer/landowner involvement, to insure long term maintenance of the buffers. The UNH Cooperative Extension, Grafton County, is currently compiling their riparian conservation buffer fact sheets using information gained during this project.

Statewide Efforts

Auto Recycler Fluid Management BMPs

Improving operations at vehicle recycling facilities was achieved through the installation of BMPs at selected automotive recycling demonstration sites. The BMPs focused on the areas of operation most likely to result in contamination to the environment. These activities are the dismantling and crushing of vehicles and the transfer and collection of petroleum products recovered from the vehicles. The BMPs included the installation of impervious pads in the areas where vehicles are dismantled and/or crushed and areas where fuel is removed from the vehicles, and secondary containment and cover for aboveground fuel storage tanks. By installing these BMPs, motor vehicle recycling facilities will protect soils, groundwater, wetlands and surface waters from unintentional discharges of motor vehicle fluids.

An auto crusher situated on an impervious pad at Car World in Candia.

Granite State Designers and Installers Septic System Workshops

The Granite State Designers and Installers Association conducted seven workshops for septic system designers and installers, soil and wetland consultants, engineers and land surveyors. The first two workshops were held in Rochester and involved the analysis of a demonstration system installed in 2000. The system was comprised of several commonly used, innovative and state approved leaching products. Several monitoring ports were installed at the time so septic professionals could witness the underground activity and evaluate performance of the system. The remaining five workshops were held in Boscawen, Unity, Hillsboro, Brentwood and Dover and focused on soil identification and analyses with a focus on upland and wetland soils.

NHDOT Erosion Control Manual Distribution and Workshop (2001)

The NH Coastal Program assisted the NHDOT in the editing and printing of a manual titled *Erosion and Sediment Control and Stormwater Management*. The NH Coastal Program then worked with the University of New Hampshire Technology Transfer Center to conduct a workshop for road agents in the 43 coastal watershed communities.

Looking Ahead

Watershed Approach

Our Watershed Approach Pilot Program drew one step closer to implementation with the release of a request for proposals in September. Leading up to the RFP release, the Watershed Management Bureau completed a statistically valid geographic information systems (GIS) analysis of 15 variables that pertain to water quality and quantity, biological resources, land resources, human influences and recreational resources. These variables were analyzed on a 10-digit hydrologic unit code (HUC) watershed scale (see map on page X), to prioritize New Hampshire's watersheds in the following management categories: need for protection, need for restoration, or threatened (see sidebar). With 81 watersheds at the 10- digit HUC scale, the GIS analysis identified the top 20 watersheds within each management category.

In FY 2005, pilot watershed approach projects will be eligible for $100,000 in grants and access to technical consultants to help local organizations develop and implement watershed management plans. A coordinator will be assigned to each watershed to facilitate access to increased DES staff assistance depending on watershed needs.

At the end of the first two years, the pilot projects will be evaluated and the Watershed Management Bureau will apply lessons learned in other watersheds.

Watershed Management Categories

In Need of Restoration

Watersheds in need of the manipulation of physical, chemical, or biological characteristics of a watershed with the goal of returning natural or historic functions of its waterbodies.

Threatened

Watersheds whose aquatic systems are unlikely to maintain chemical, physical, and biological integrity due to anthropogenic influences.

In Need of Protection

Watersheds in need of taking action to prevent or restrict human activity in a watershed in order to prevent degradation of water quality.

Environmental Results

How much water quality improvement does $100,000 buy? We want to know what we're getting for our money when we spend it on watershed projects. Is water quality improving? By how much? How do we know? Answers to these questions are not as apparent as we might hope due to the many land uses that make up a watershed and the many variables that influence water quality at any given location in a river or stream, pond, lake, or wetland. We continue to require grant applicants to measure or estimate pollutant load reduction achieved by BMPs. For a listing of estimates, see Appendix D.

Working with the New England states and New York, the New England Interstate Water Pollution Control Commission secured a grant from the USEPA to adapt the ArcView Generalized Watershed Loading Function (AVGWLF, or "average wolf") to New England. AVGWLF was created by Dr. Barry Evans of Penn State University and has proven successful in modeling pollutant loads in Pennsylvania watersheds. We expect to calibrate the model for New England during 2005, and to secure funding to populate the model with GIS data for use in New England by 2007.

Appendices

A. Section 319 NPS Local Initiative Grants Awarded in FFY 2004

Grantee	Project Name	NPS Category	Source of Funds (FFY)	Grant Award
NH Dept. of Agriculture	Agriculture Nutrient Mgt. Grant Program	Agriculture	2004	$30,000
Various	Small education and outreach	General	2004	$20,000
City of Nashua	Nashua wetlands buffer outreach	Stormwater runoff	2004	$8,025
DES Biology Section	Lake and watershed feasibility study of Perkins Pond, Sunapee	Subsurface system	2004	$6,300
Green Mountain Conservation Group	Ossipee watershed environment planning initiative	General	2004	$30,000
University of New Hampshire	Management of non-human sources of fecal-borne bacteria	Stormwater runoff	2004	$59,022
DES Waste Management Division	NH Green Yards Program, Phase II	Junk, salvage & reclamation yards	2004	$33,400
City of Portsmouth	Bartlett Street Storm-water Treatment	Stormwater runoff	2004	$50,000
UNH SEA Grant and Cooperative Extension	Protecting water resources in NH's coastal communities	Construction	2004	$22,563
DES Air Resources Division	Mapping NH forest sensitivity to acid deposition	Other NPS pollution	2004	$20,00
		Total Awards		**$279,310**

Section 319 Watershed Restoration Grants Awarded in FFY 2004

Grantee	Project Name	Watershed	Source of Funds (FFY)	Grant Award
Homestead Designs	Hampton/Seabrook Harbor restoration and implementation plan	Coastal	2002	$4,220
University of New Hampshire	Determining sources of fecal borne bacteria in Mill Creek and Cains Brook	Coastal	2003	$35,000
UNH SEA Grant and Cooperative Extension	Storm drain stenciling in Hampton/Seabrook Harbor watersheds	Coastal	2003	$2,836
Town of Seabrook	Beach Street catch basin replacment program	Coastal	2003	$7,000
			Subtotal	**$49,056**

B. Section 319 Restoration Projects Completed in FFY 2004

Grantee	Project Name	Source of Funds	Grant #	319 Funds	Completed	Water-shed
Belknap County Conservation District	NPS pollution reduction for Center Harbor Bay, Lake Winnipesaukee	1999	R-99-M-03	$50,090	12/30/2003	Merrimack
Town of Seabrook	Treatment of stormwater runoff from Rte 1A	1999	R-99-C-03	$56,000	1/9/2004	Coastal
University of New Hampshire	BMP verification project for stormwater treatment	1999	R-99-C-08	$52,560	6/30/2004	Coastal
Carroll County Conservation District	Chocorua Lake restoration, Phase II monitoring	2000	R-00-S-01	$12,000	5/28/2004	Saco
City of Manchester	Watershed sensitive parking area & educational kiosk	2000	R-00-M-06	$13,080	4/23/2004	Merrimack
City of Nashua	Mine Falls Park bank erosion	2000	R-00-M-04	$9,763	6/3/2004	Merrimack
Merrimack County Conservation District	NPS pollution demonstration at Marstons Dairy	2000	R-00-M-03	$22,840	12/30/2003	Merrimack
Town of Stratham	Stratham Circle Mill Pond restoration	2000	R-00-C-02	$66,520	12/31/2003	Coastal
Town of Wolfeboro	Mill Street, install stormwater treatment & upgrades	2000	R-00-M-05	$20,000	9/15/2004	Merrimack
Applehurst Dairy	Applehurst Dairy Farm stormwater project	2001	R-01-C-03	$36,665	4/20/2004	Coastal
City of Rochester	Spring Street outfall rehabilitation project	2001	R-01-C-08	$0	Closed 1/1/04. No progress	Coastal
Strafford County	Strafford County canoe launch	2001	R-01-C-09	$1,044	12/11/2003	Coastal
Swift River Local Advisory Committee	Channel stability analysis at Conway Scenic RR Bridge, Swift River	2001	R-01-S-01	$9,600	5/24/2004	Saco
Town of Litchfield	Darrah Pond erosion and sediment control	2001	R-01-M-10	$9,681	12/31/2003	Merrimack
Association of US Delegates to the Gulf of Maine Council	Gulf Watch blue mussel monitoring	2002	R-02-C-02	$3,978	10/7/2003	Merrimack
City of Portsmouth	Peirce Island shoreline stabilization, Phase II	2002	R-02-C-03	$68,000	8/1/2004	Coastal

C. Section 319 Base Projects Completed in FFY 2004

Grantee	Project Name	Source of Funds	Grant #	319 Funds	Date Completed
NH Department of Resources and Economic Development	Franconia Notch/Lafayette Campground Erosion Mitigation and Control	1998	B-98-M-06	$1,388	Closed 2/18/04. Project not completed
Souhegan Watershed Assn.	Souhegan Watershed Assn. Organization Building	1998	B-98-M-03	$12,700	Closed 3/15/04. Project not completed
Laconia, City of	Weirs Beach Stormwater Evaluation and Design	1999	B-99-M-04	$13,000	Closed 2/18/04. Project not completed
Grafton County Conservation District	Baker River Watershed Erosion Control Project	1999	B-99-M-07	$23,435	12/3/2003
Merrimack County Conservation District	Great Ash Farm	2000	B-00-M-06	$46,583	8/18/2004
Rochester Department of Public Works	EPA Phase II NPDES Stormwater Public Education Video	2001	B-01-C-17	$21,000	12/31/2003
Henniker Conservation Commission	Quantification of Tributary Phosphorus Loading to French Pond	2001	B-01-M-02	$6,500	Closed 3/2/04. Project not completed
Merrimack River Watershed Council	PowWow River Watershed Buildout Project	2001	B-01-M-01	$3,000	Closed 2/18/04. Project not completed
NHDES - Biology Section	Vortechs Stormwater Treatment Study	2001	B-01-M-08	$4,972	Closed 3/19/04. Project not completed
NH Office of State Planning	NH DOT Erosion Control Manual Distribution and Workshop	2001	B-01-SW-20	$9,318	6/2/2004
The Baker River Watershed Association	Watershed Management Plan for the Baker River	2001	B-01-M-11	$12,000	12/30/2003
Newbury, Town of	Gillingham Drive Stormwater Mgt.	2001	B-01-M-10	$3,600	12/26/2003
UNH Cooperative Extension, Grafton County	Riparian Buffer Research, Demonstration, and	2001	B-01-CT-12	$115,249	4/21/2004
Green Mountain Conservation Group	Ossipee Watershed Water Quality Monitoring Project	2002	B-02-S-13	$15,000	10/23/2003
Merrimack River Watershed Council	Salmon Brook Assessment and Revitalization Project	2002	B-02-M-07	$0	Closed 10/29/2003. No progress
NH Auto & Truck Recyclers Association	Auto Recycler Fluid management BMPs	2002	B-02-SW-11	$28,255	3/19/2004
Rockingham Planning Commission	Shoreline Habitat Assessment and Land Protection along the Exeter	2002	B-02-C-09	$9,680	2/20/2004
Granite State Designers and Installers	Septic System Workshops	2003	B-03-SW-12	$13,925	5/28/2004

D. Projects with Load Reductions

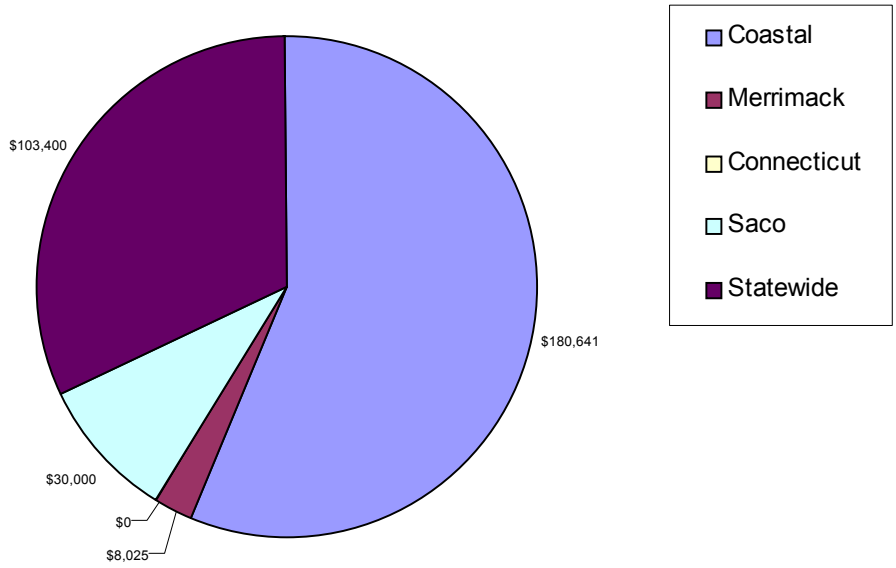
Project No.	Project Name	Grantee	Date Completed	Funding Amount	Model	Targeted for Reduction	Estimated Reduction
R-02-M-02	Baker River restoration	Town of Warren	Current project	$13,667	Engineering calcs	Sediment	68,600 tons sediment
R-02-M-06	Reducing nutrient loading to Hunkins Pond from Swain Farm	Belknap County Conservation District	Current project	$51,130	Engineering calcs	Nitrogen, phosphorus	600-800 lbs/yr N; and 150-200 lbs/yr P
R-02-M-08	Middle Brook Canal dredging	Balmoral Improvement Association	Current project	$51,126	Engineering calcs	Sediment volume	4,100 cubic yds of sediment to be removed from canal
R-02-M-10	Whitten Neck Road stormwater project	Town of Wolfeboro	Current project	$10,800	BMP device manufacturer calcs	Suspended sediment	80% of TSS
R-02-M-11	Breezy Point shoreline stabilization	Breezy Point Cond. Association	Current project	$27,000	Engineering calcs	Sediment	50 cubic ft/yr sediment
R-02-M-12	Mill Brook stabilization	Town of Thornton	Current project	$27,527	Engineering calcs	Sediment	715 tons sediment
R-03-C-03	Beech Street catch basin	Town of Seabrook	Current project	$7,000	Pre- vs. post-BMP sampling	Sediment volume in catch basins	Pending results in final report
R-99-C-03	Treatment of stormwater runoff from Rte 1A Seabrook	Town of Seabrook	1/9/2004	56,000	Pre- vs. post-BMP sampling	E-coli, fecal coliforms, enterococci	Overall load reduction of 50.3% fecal coliforms; 51.3% for E-coli; and 43.2% enterococci
R-99-C-08	BMP verification for stormwater treatment device	University of New Hampshire	6/30/2004	52,560	Pre- vs. post-BMP sampling	E-coli, fecal coliforms, enterococci	Overall load reduction of 50.3% fecal coliforms; 51.3% for E-coli; and 43.2% enterococci
R-00-M-05	Mill Street stormwater upgrades	Town of Wolfeboro DPW	9/15/2004	20,000	BMP device manufacturer calcs	Sediment	80.4% of TSS
B-00-M-06	Great Ash Farm project	Merrimack County Conservation Dist.	8/18/2004	46,583	NRCS calcs	E-coli, DO, pH, turbidity, nitrogen, phosphorus	12 tone/yr soil and manure mix; 4,082 lbs/yr N; 635 lbs/yr P
R-00-S-01	Chocorua Lake restoration Phase II	Carroll County Conservation Dist.	5/28/2004	12,000	Pre- vs. post-BMP sampling	Turbidity, TSS, TP, conductivity, temp.	Measured 92% reduction in P
R-01-C-03	Applehurst Dairy Farm stormwater project	Applehurst Dairy	4/20/2004	36,665	Region 5 model	COD, phosphorus	1,818 lbs COD; and 34 lbs P based on 25-year storm event
R-01-M-03	Mill Pond restoration Phase II	Nashua Regional Planning Commission	12/31/2004	14,250	Pre- & post-BMP sampling, & BMP devise manufacturer calcs	TP, pH, ANC, conductivity, turbidity, suspended sediment	80% of TSS
R-02-CT-01	Bog Brook restoration project	Town of Stratford	10/1/2004	14,912	Engineering calcs	Sediment	120 tons/yr sediment
R-02-C-03	Peirce Island shoreline stabilization	City of Portsmouth	8/1/2004	68,000	Engineering calcs	Sediment	25-40 tons/yr sediment
R-99-CT-01A	MacGlaughlin Farm restoration project	Conservation District	4/7/2003	38,225	Manure application calcs	Nitrogen	13,689 lbs N
R-99-M-03	NPS reduction for Center Harbor Bay	Center Harbor and Belknap County Conserv. Comm.	12/30/2003	50,090	Region 5 model	BOD, COD, TSS, zinc, TN, TP	COD; 1,605 lbs/yr TSS; 1 lb/yr zinc; 17 lbs/yr TN; 5 lbs/yr TP
R-01-M-10	Darah Pond erosion & sediment control	Town of Litchfield	12/31/2003	9,681	NRCS calcs	Sediment	6.4 tons/yr sediment
R-99-C-02	Heron Point and Sliding Rock restoration project	Town of Newmarket	8/26/2002	9,000	NRCS estimated soil loss	Sediment	Heron Point 6 tons/yr sediment; Sliding Rock 13.6 tons/yr sediment
R-99-C-06	Roof runoff project	Jan-Mar Farm	8/2/2002	19,862	NRCS estimated soil loss	Sediment	1-15 tons/yr sediment
R-99-CT-01	Clark Brook watershed restoration	Grafton County Conservation District	9/18/2001	32,000	Manure application calcs	Nitrogen, phosphorus, potassium	2,095-4,190 lbs/yr N; 869-1,737 lbss/yr P; 1,686-3,373 lbs/yr K
B-99-CT-09	Beck Brook runoff response program	Lake Sunapee Protective Assoc.	12/31/2001	10,500	Pre- vs. post-BMP sampling, & engineering calcs	pH, TP, conductivity, turbidity, COD, BOD	Settling basin 1,376 lbs/yr total pollutants; grass swale 1,105 lbs/yr total; vegetated filter strip 2,396

E. Agricultural Nutrient Management Grants Awarded SFY 2004

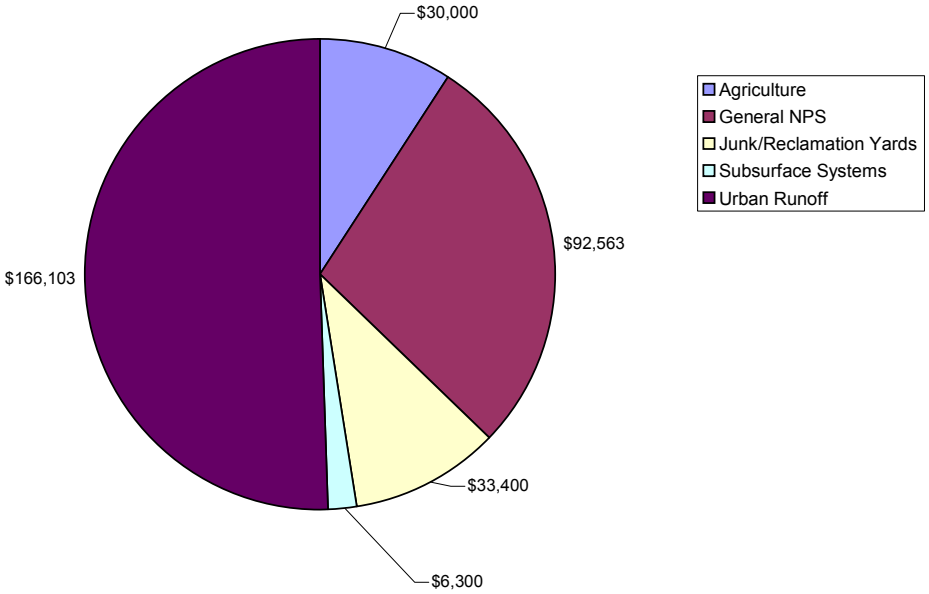
Grant Award	Management Practice	Recipient	Town	Operation Type
$1,600	Barnyard Drainage	Karen Grybko	Lyndeborough	Misc. livestock
$2,500	Roofed concrete pad	Rocky Meadow Farm	Francestown	Beef cattle
$2,500	Innovative milk house waste disposal	Stonewall Farm	Keene	Dairy farm
$2,500	Seasonal heavy use area	Brookfield Farm	Walpole	Beef cattle
$2,500	Pasture fencing	Anton Angelich	Lempster	Beef cattle
$2,200	Fencing and wetland crossing	Serendipity Farm	Canterbury	Llama, sheep, goats
$2,500	Heavy use area protection	John Ciano	Canterbury	Beef cattle
$2,493	Stream fencing	Stillmaple Farm	Plymouth	Misc. livestock
$2,500	Manure drainage improvement	Never Done Farm	New London	Horse farm
$1,480	Milk house waste treatment	Gary Peters	Bath	Dairy farm
$2,500	Fertilizer storage pad	Richard Flint	Milan	Dairy farm
$ 664	Roof runoff drainage	Echo Farm	Hinsdale	Dairy farm
$ 815	Soil compaction	Coos County Conserv Dist.	Lancaster	Education & Research
$2,500	Landscapes nutrient mgt. improve.	UNH Coop. Ext.	Durham	Education & Research
$2,500	Soil testing & environment assess.	UNH Coop. Ext.	Woodsville	Education & Research
$1,240	Manure composting	Penelope DePeyer	Goshen	Horse farm
$2,500	Heavy use area	Yeaton Farm	Epsom	Dairy farm
$2,500	Manure storage facility	Otokane Farm	Jefferson	Beef cattle
$2,500	Manure storage facility	Coos Cnty Farm	Colebrook	Dairy farm
$2,500	Milk house waste system	Gingue Farm	N. Stratford	Dairy farm
$2,500	Runoff Management	Elizabeth Olivier	Andover	Horse farm
$2,500	Manure storage facility	Scott Malinson	Chester	Horse farm
$2,500	Livestock fencing	Starry Night Farm	Warner	Alpaca farm
$2,500	Livestock fencing	Melanie Benton	New Hampton	Dairy goat farm
$2,500	Fencing and stream crossing	J. William Kenney	Franconia	Beefalo farm
$ 885	Manure storage	Barbara Gaskell	Washington	Dairy goat farm
$1,700	Manure composting	Scott Denoncourt	Canterbury	Horse farm
$2,500	Manure storage	Mark Ober	Ashland	Beef cattle
$2,500	Manure stacking pad	Flint Family Farm	Milan	Dairy farm
$2,500	Milk house waste treatment – phase II	Stonewall Farm	Keene	Dairy farm
$2,500	Wetland drainage	Brian Farmer	Warner	Buffalo farm
$2,500	Manure storage	Rich-Lin Farm	Barnstead	Horse farm
$2,500	Nutrient Mgt. Research	UNH Coop. Ext.	Woodsville	Education & Research

F. Graphs Showing Distribution of Section 319 Grant Dollars

Distribution of 2004 Section 319 Grant Dollars by Watershed



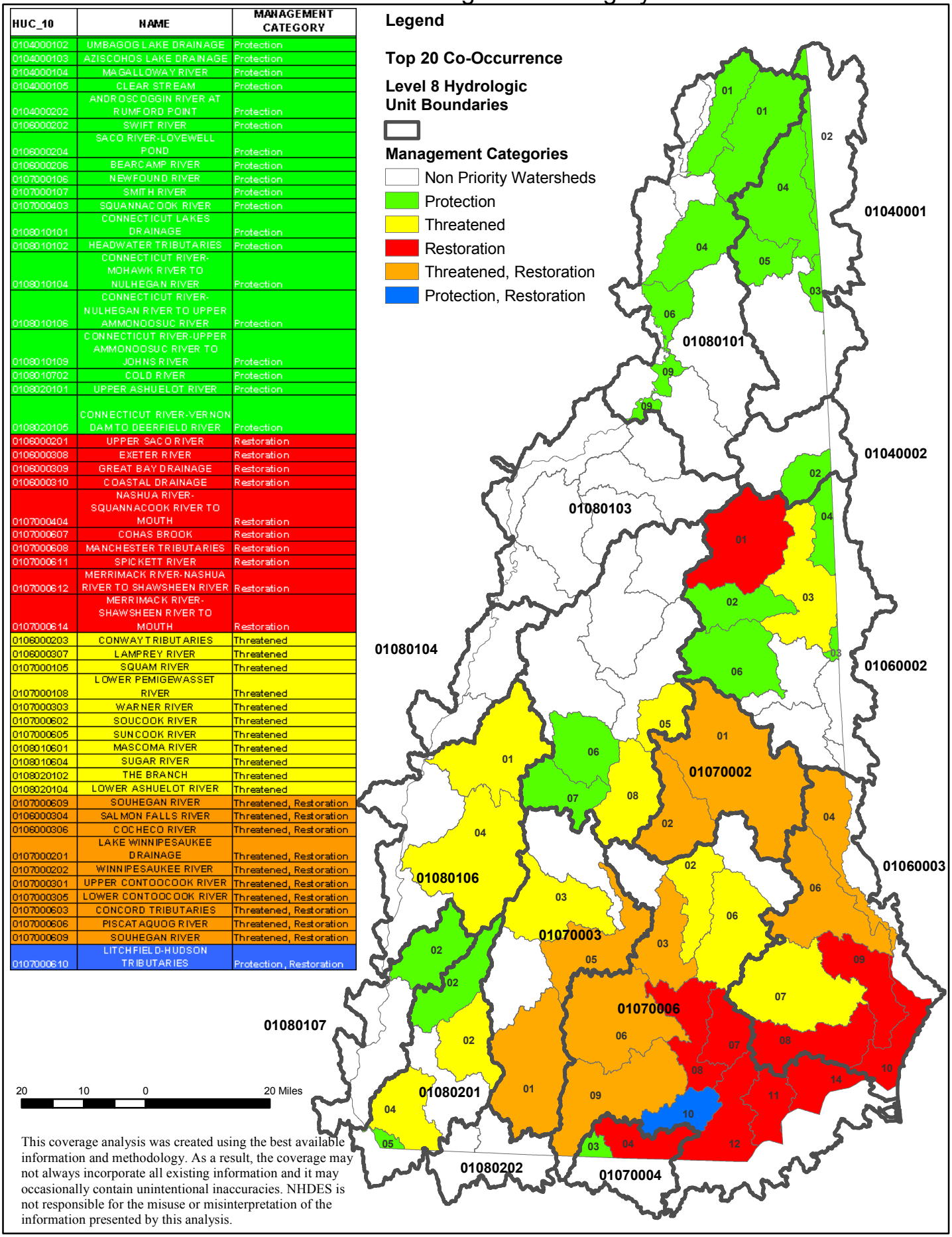
Distribution of 2004 Awarded Section 319 Grant Dollars by NPS Category



NH Department of Environmental Services Watershed Approach

Top 20 Watersheds
- from each Management Category

HUC_10	NAME	MANAGEMENT CATEGORY
0104000102	UMBAGOG LAKE DRAINAGE	Protection
0104000103	AZISCOHOS LAKE DRAINAGE	Protection
0104000104	MAGALLOWAY RIVER	Protection
0104000105	CLEAR STREAM	Protection
0104000202	ANDROSCOGGIN RIVER AT RUMFORD POINT	Protection
0106000202	SWIFT RIVER	Protection
0106000204	SACO RIVER-LOVEWELL POND	Protection
0106000206	BEAR CAMP RIVER	Protection
0107000106	NEWFOUND RIVER	Protection
0107000107	SMITH RIVER	Protection
0107000403	SQUANNACOOK RIVER	Protection
0108010101	CONNECTICUT LAKES DRAINAGE	Protection
0108010102	HEADWATER TRIBUTARIES	Protection
0108010104	CONNECTICUT RIVER-MOHAWK RIVER TO NULHEGAN RIVER	Protection
0108010106	CONNECTICUT RIVER-NULHEGAN RIVER TO UPPER AMMONOOSUC RIVER	Protection
0108010109	CONNECTICUT RIVER-UPPER AMMONOOSUC RIVER TO JOHNS RIVER	Protection
0108010702	COLD RIVER	Protection
0108020101	UPPER ASHUELOT RIVER	Protection
0108020105	CONNECTICUT RIVER-VERNON DAM TO DEERFIELD RIVER	Protection
0106000201	UPPER SACO RIVER	Restoration
0106000308	EXETER RIVER	Restoration
0106000309	GREAT BAY DRAINAGE	Restoration
0106000310	COASTAL DRAINAGE	Restoration
0107000404	NASHUA RIVER-SQUANNACOOK RIVER TO MOUTH	Restoration
0107000607	COHAS BROOK	Restoration
0107000608	MANCHESTER TRIBUTARIES	Restoration
0107000611	SPICKETT RIVER	Restoration
0107000612	MERRIMACK RIVER-NASHUA RIVER TO SHAWSHEEN RIVER	Restoration
0107000614	MERRIMACK RIVER-SHAWSHEEN RIVER TO MOUTH	Restoration
0106000203	CONWAY TRIBUTARIES	Threatened
0106000307	LAMPREY RIVER	Threatened
0107000105	SQUAM RIVER	Threatened
0107000108	LOWER PEMIGEWASSET RIVER	Threatened
0107000303	WARNER RIVER	Threatened
0107000602	SOUCOOK RIVER	Threatened
0107000605	SUNCOOK RIVER	Threatened
0108010601	MASCOMA RIVER	Threatened
0108010604	SUGAR RIVER	Threatened
0108020102	THE BRANCH	Threatened
0108020104	LOWER ASHUELOT RIVER	Threatened
0107000609	SOUHEGAN RIVER	Threatened, Restoration
0106000304	SALMON FALLS RIVER	Threatened, Restoration
0106000306	COCHECO RIVER	Threatened, Restoration
0107000201	LAKE WINNIPESAUKEE DRAINAGE	Threatened, Restoration
0107000202	WINNIPESAUKEE RIVER	Threatened, Restoration
0107000301	UPPER CONTOOCOOK RIVER	Threatened, Restoration
0107000305	LOWER CONTOOCOOK RIVER	Threatened, Restoration
0107000603	CONCORD TRIBUTARIES	Threatened, Restoration
0107000606	PISCATAQUOG RIVER	Threatened, Restoration
0107000609	SOUHEGAN RIVER	Threatened, Restoration
0107000610	LITCHFIELD-HUDSON TRIBUTARIES	Protection, Restoration



This coverage analysis was created using the best available information and methodology. As a result, the coverage may not always incorporate all existing information and it may occasionally contain unintentional inaccuracies. NHDES is not responsible for the misuse or misinterpretation of the information presented by this analysis.

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Layer Description

NH DES Watershed Approach Geospatial Variables	
Description	**Resource Category**
Indicator of watershed fish community uniqueness.	Biological Resources
Length of free flowing river per river mile	Biological Resources
Measure of watershed invertebrate community health (quality)	Biological Resources
Indicator of watershed invertebrate community uniqueness.	Biological Resources
Rate of change of population between 1990 Census and 2000 Census	Human Factors
Road mileage per total acreage	Human Factors
Estimated acreage impact of wetland permits on wetlands	Human Factors
Unprotected stream headwaters (with an 150 ft buffer) that are forested	Land Resources
Unprotected unfragmented natural lands	Land Resources
Agricultural land (based on land use coverage) that is not protected	Land Resources
Chance that waters will be come infected with exotics by downstream hydrologic transport	Recreational Resources
Number of waterbodies with exotic species	Recreational Resources
Number of fishing derbies/tournaments	Recreational Resources
Percentage of HUC10 that is surface water	Recreational Resources
Acreage of surface water over 2000 ft in elevation per total surface water	Recreational Resources
Number of recreational and support facilities per land acre	Recreational Resources
Miles of Class I and II roads within 1 mile of ponds greater than 10 acres and 4th order streams	Recreational Resources
Number of impoundments per river/stream mile	Water Resources
Length of impounded river per river mile	Water Resources
Combination of prime wetlands and designated river reaches	Water Resources
Population served by a municipal water supply per acre	Water Resources
Number of NPDES (National Pollutant Discharge Elimination System Outfalls) per river mile	Water Resources
Portion of fully supporting designated uses per 2002 305b/303d list	Water Resources
Portion of impaired designated uses per 2002 305b/303d list	Water Resources
Number of private wells per acre	Water Resources
Worst case seasonal average withdrawal, adjusted for seasonality of river flow	Water Resources